RF EXPOSURE EVALUATION REPORT

Product Name: RUGGED

Trade Mark: VIX

Model No.: RUGGED-AACA-R01

HVIN: RUGGED-AACA-R01

Report Number: 2209071437RFC-2

Test Standards: FCC 47 CFR Part 1 Subpart I
RSS-102 Issue 5

FCC ID: 2AIKG-RUGGED

IC: 25270-RUGGED

Test Result: PASS

Date of Issue: December 14, 2022

Prepared for:

Vix Technology (Aust) Pty Ltd
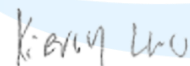**Level 1, 50 St Georges Tce Perth, 6000 Australia**

Prepared by:

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Prepared by:		Reviewed by:	
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	Assistant Manager		

Version

Version No.	Date	Description
V1.0	December 14, 2022	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Vix Technology (Aust) Pty Ltd
Address of Applicant:	Level 1, 50 St Georges Tce Perth, 6000 Australia
Manufacturer:	Vix Technology (Aust) Pty Ltd
Address of Manufacturer:	Level 1, 50 St Georges Tce Perth, 6000 Australia

1.2 EUT INFORMATION

Product Name:	RUGGED
Model No.:	RUGGED-AACA-R01
Add. Model No.:	See Note
HVIN	RUGGED-AACA-R01
Trade Mark:	VIX
DUT Stage:	Identical Prototype
Sample Received Date:	September 1, 2022

Note: The following is a breakdown of the EUT part numbers:

```
        RUGGED      -   *   *   *   *   -   *   *   *

          1             2   3   4   5           6
```

1: Defines the product name, in this case **RUGGED** for Rugged Validator.

2: Defines the mechanical configuration of the device. There is currently only one configuration available:
    A: Pole Mount

3: Defines the type of memory for the device. There is currently only one memory type available:
    A: 1GB DDR3L SDRAM and 2GB NAND Flash

4: Defines the optional features (Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth) available in the model. Currently the following options are available:
    A: With Bar Code & QR Reader
    B: No added optional features (but no Touch Screen)
    C: With Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
    D: No added optional features (Standard model)
    E: With 2.4GHz WiFi & Bluetooth
    F: With 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
    G: With Bar Code & QR Reader / 2.4GHz WiFi & Bluetooth
    Note: Different combinations may be added in the future, but their included features will still be within the ones available in the fully featured C variant listed above (i.e. Touch Screen / Bar code & QR reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth).

5: Defines the aesthetics and artwork for the device. Currently the following options are available:
    A: Standard Front Casing / Standard Rear Casing / Standard Glass Artwork
    B: Standard Front Casing / Standard Rear Casing / Custom-01 Glass Artwork
    Note: Different options may be added in the future based on customer requirement.

6: Defines the device version number.
    R01: Revision 1

The test device is the RUGGED-AACA-R01 model, which includes all optional electronics peripheral features. The test data is gathered from a production sample (RUGGED-AACA-R01), provided by the manufacturer.

Manufacturer discrepancy declaration letter：

Assure Rugged Validator Model Variations Declaration

Assure Rugged Validator Model Variations Declaration

We hereby confirm that the test report covers all the model numbers fall under *RUGGED-****-****
Where the detailed explanation of the model number breakdown is as follows:

RUGGED   -   * * * * - * * *
     1   2 3 4 5   6

1: Defines the product name, in this case **RUGGED** for Rugged Validator.

2: Defines the mechanical configuration of the device. There is currently only one configuration available:
   A: Pole Mount

3: Defines the type of memory for the device. There is currently only one memory type available:
   A: 1GB DDR3L SDRAM and 2GB NAND Flash

4: Defines the optional features (Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth) available in the model. Currently the following options are available:
   A: With Bar Code & QR Reader
   B: No added optional features (but no Touch Screen)
   C: With Bar Code & QR Reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
   D: No added optional features (Standard model)
   E: With 2.4GHz WiFi & Bluetooth
   F: With 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth
   G: With Bar Code & QR Reader / 2.4GHz WiFi & Bluetooth
   Note: Different combinations may be added in the future, but their included features will still be within the ones available in the fully featured C variant listed above (i.e. Touch Screen / Bar code & QR reader / 4G & 3G & 2G / 2.4GHz WiFi & Bluetooth).

5: Defines the aesthetics and artwork for the device. Currently the following options are available:
   A: Standard Front Casing / Standard Rear Casing / Standard Glass Artwork
   B: Standard Front Casing / Standard Rear Casing / Custom-01 Glass Artwork
   Note: Different options may be added in the future based on customer requirement.

6: Defines the device version number.
   R01: Revision 1

The device used for the compliance testing is the **RUGGED-AACA-R01** model, which covers all the optional electronics peripheral features that are available to the Rugged Validator. There may be different model variants added in the future, but as per mentioned in the above detailed part number explanation, their optional electronics peripheral features will still be within the options included in the **RUGGED-AACA-R01** model.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely,

Jiali (Carrie) Huang
Senior Hardware Engineer

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Date: 21/11/2022

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VIX

1.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 1 Subpart I
RSS-102 Issue 5

All test items have been performed and recorded as per the above standards

1.4 DEVIATION FROM STANDARDS
None.

1.5 ABNORMALITIES FROM STANDARD CONDITIONS
None.

1.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER
None.

2. PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Please refer to the RF module test report.

RF Technology			Report No.:
2.4 GHz ISM Band:	IEEE 802.11b/g/n		1811FS15
	Bluetooth LE		
	ZigBee		
WWAN	GSM Bands:	GSM850/ 1900	200722013RFC-1R1 210809036RFC-1
	UTRA Bands:	Band II/ Band IV/ Band V	
	UTRA Bands:	FDD Band 2/ Band 4/ Band 5/ Band 7/Band8/ Band 12/ Band 13/ Band 26/ Band 66	
		TDD Band 38/ Band 41	

3. MPE EVALUATION
3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	RSS-102 Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
3	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES
4	KDB 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

3.2 MPE COMPLIANCE REQUIREMENT
3.2.1 Limits
3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Limits for Occupational / Controlled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm²)	Averaging Times | E |², | H |² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

Limits for General Population / Uncontrolled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm²)	Averaging Times | E |², | H |² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	**1**	30

Note: f = frequency in MHz: * = Plane-wave equivalents power density.

3.2.1.2 RSS-102 Issue 5

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

According to RSS-102 Issue 5, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

3.2.2   Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3.3 MPE CALCULATION METHOD

FCC 47 CFR Part 1 Subpart I

$S = PG/4\pi R^2 = EIRP/4\pi R^2$

S = power density (in appropriate units, e.g., mw/cm2)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = 20cm distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

3.4 MPE CALCULATION RESULTS

Note: For the test results, only the worst case was shown in test report.

3.4.1   Results for FCC 47 CFR Part 1 Subpart I

For WLAN

Operating Mode	Declared maximum conducted output power	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm²)	
IEEE 802.11n20	17.5	0.99	18.49	70.6318	1.0	0.0141

For Bluetooth

Operating Mode	Declared maximum conducted output power	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm²)	
Bluetooth LE	17.5	0.99	18.49	70.6318	1.0	0.0141

For ZigBee

Operating Mode	Declared maximum conducted output power	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(dBm)	(dBi)	(dBm)	(mW)	(mW/cm²)	
ZigBee	17.0	0.99	17.99	62.9506	1.0	0.0125

For WWAN

Operating Mode	Declared maximum conducted output power	Antenna Gain	Calculated maximum EIRP	Duty cycle	Equivalent EIRP	MPE Limit	MPE Value
	(dBm)	(dBm)	(dBm)	(%)	(mW)	(mw/cm²)	
GSM 850	35	1	36	1:8.3	479.7334	0.5495	0.0954
WCDMA FDD Band 2	25	5	30	1:1	1000.0000	1.0	0.1989
LTE Band 2	25	5	30	1:1	1000.0000	1.0	0.1989
Note 1: Equivalent EIRP = Declared maximum EIRP * Duty cycle.							

3.4.2   Results for RSS-102 Issue 5

For WLAN

Operating Mode	Declared maximum conducted output power	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
	(dBm)	(dBi)	(dBm)	(W)	(W)
IEEE 802.11n20	17.5	0.99	18.49	0.0706	2.6840

For Bluetooth

Operating Mode	Declared maximum conducted average output power	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
	(dBm)	(dBm)	(dBm)	(W)	(W)
Bluetooth LE	17.5	0.99	18.49	0.0706	2.6764

For ZigBee

Operating Mode	Declared maximum conducted average output power	Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	Limit
	(dBm)	(dBm)	(dBm)	(W)	(W)
ZigBee	17.0	0.99	17.99	0.0630	2.6787

For WWAN

Operating Mode	Declared maximum conducted output power	Antenna Gain	Calculated maximum EIRP	Duty cycle	Equivalent EIRP	Limit
	(dBm)	(dBm)	(dBm)	(%)	(W)	(W)
GSM 850	35	1	36	1:8.3	0.4797	1.2885
WCDMA FDD Band 2	25	5	30	1:1	1.0000	2.2410
LTE Band 2	25	5	30	1:1	1.0000	2.2410
Note 1: Equivalent EIRP = Declared maximum EIRP * Duty cycle.						

3.4.3 Simultaneous Multi-band Transmission MPE Analysis
3.4.3.1 List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Support/Not Support
1	WLAN + WWAN	Support
2	Bluetooth + WWAN	Support
3	ZigBee+ WWAN	Support

3.4.3.2 Results for transmit simultaneously

FCC 47 CFR Part 1 Subpart I

No.	Configurations	Maximum MPE Value					Limits
		WLAN	WWAN	Bluetooth	ZigBee	Transmit simultaneously	
1	WLAN + WWAN	0.0141	0.1989	/	/	0.2130	1
2	Bluetooth+ WWAN	/	0.1989	0.0141	/	0.2130	1
3	ZigBee+ WWAN	/	0.1989	/	0.0125	0.2114	1
Note:							
According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:							
Transmit simultaneously MPE = Σ of MPE ratios							
MPE ratios = Field strengths or power density / MPE limit at the test frequency							

RSS-102 Issue 5

No.	Configurations	Maximum MPE Value					Limits
		WLAN	WWAN	Bluetooth	ZigBee	Transmit simultaneously	
1	WLAN + WWAN	0.0706	1.0000	/	/	0.4725	1
2	Bluetooth+ WWAN	/	1.0000	0.0706	/	0.4726	1
3	ZigBee+ WWAN	/	1.0000	/	0.0630	0.4697	1
Note:							
According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:							
Transmit simultaneously MPE = Σ of MPE ratios							
MPE ratios = Field strengths or power density / MPE limit at the test frequency							

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***

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